



## Location Factors for Data Centers

**Data centers are booming in locations where power is cheap and hazards are few.**

Steve Stackhouse (Aug/Sep 09)

Niagara Falls means a lot of things to a lot of people. For tourists, it's breathtaking beauty. For newlyweds, it's the perfect honeymoon destination. For site selectors at Yahoo!, it's the force behind vast supplies of cheap, renewable energy. That's one of the reasons the Internet behemoth chose the New York community of Lockport — just about 20 miles from the falls — for its newest data center. The location gives Yahoo! the opportunity to run its facility primarily with hydroelectric power from the falls, giving it the promise of being not only less expensive to operate but also one of the greenest data centers in the world.

This decision underscores one of the primary facets of data center development — electricity is a powerful motivator. It also illustrates the growing desire by those building data centers to be as environmentally friendly as possible.

What Yahoo! announced this summer was a \$150 million project not far from Buffalo, according to Tom Kucharski, president and CEO of Buffalo Niagara Enterprise. Set on a 30-acre site in an industrial park, the facility is expected to create as many as 125 jobs, not counting construction labor. "These are very good jobs," says Kucharski. "Typically, when Yahoo! puts in this type of facility, a number of collaborative companies put facilities around it."

Indeed, a Yahoo! data center announced in 2006 in Wenatchee, Washington — another place with abundant and inexpensive hydro power — opened the door for additional development, according to Hamilton Southworth, a corporate managing director in the Silicon Valley offices of the commercial real estate services firm Studley Inc. "Yahoo! identified that there was some of the cheapest electrical power there — plentiful, clean power," he says. "Microsoft followed suit and also various others, and now you have a data center industry in eastern Washington state."

Kucharski is eager to enjoy similar success showing off the Yahoo! feather in his upstate New York agency's cap. "Data centers are strategic for our area," he says. "This is the biggest one to date. There are a couple more currently under development."

### Boom Time for Data Centers

"The data center business is as hot as it was during the dot-com buildup — hopefully we won't see any bubbles bursting," says Pitt Turner, president and managing principal of Uptime Institute Professional Services, which consults with data center designers and engineers. "More and more companies are in a position where they need to augment or supplement, or take a giant step forward, in their IT capabilities."

Southworth sees three distinct types of data center developments. There are the biggies — the massive, power-hungry centers developed by such recognizable names as Google, Facebook, and Yahoo! that have an ever-expanding need for computing power. There are smaller data centers that many other kinds of companies build for themselves onsite. And then there are third-party operators: "They aggregate the demand from small users and build large data centers," he says.

Where such data centers choose to locate depends a lot on the type of data center and the type of business it's serving. There are so many variables that it's hard to pin down hot spots where data centers are clustering. Yes, areas with hydro power and other cheap energy are getting a lot of attention, but the truth is that data centers are sprouting all over.

"There isn't a specific ZIP code that is landing them all," says Turner, "but by region, the Midwest seems to be getting a lot of them. East Coast companies may put a data center in the Midwest to provide assurance of business recovery and continuity."

One recent study by The Boyd Company Inc., a New Jersey location consultancy, found that overall costs make the middle part of the continent seem more attractive than the coasts. The firm compared what it would cost to operate an average-size data center in the country's biggest financial centers plus several other cities, and found that the least expensive was Sioux Falls, South Dakota. Winston-Salem, North Carolina, and San Antonio, Texas, fared well, too, but the majority of the lowest-cost locations carried addresses in such places as Iowa, Alabama, Indiana, Oklahoma, and Ohio. New York and San Francisco were the priciest.

### Why They Go Where They Go

According to Southworth, a number of things dictate where a data center should be located. "The first is the availability of large amounts of inexpensive electricity," he says. Turner agrees: "The two most important interactions would be with network presence and power. The cost of power and the availability of power are high on the list."

Data centers suck up an amazing amount of electricity. That's because they're an aggregation of hundreds or thousands of computer servers, most of which are up and running all the time. On top of that, those heat-creating servers need to be kept cool, causing more need for energy. Everything typically needs to be redundant, which means that every server may have a backup, and every cooling system may as well. And so does the power system — that backup is often onsite generation capability.

"The amount of power consumed over a number of years will cost more than the center itself," says Turner. "Because of the amount of power consumed, the

rate for that power becomes one of the largest economic differentiators." No wonder Yahoo! likes hydro power. It's estimated that the power Yahoo! has been promised in the Buffalo area might save the company as much as \$100 million over 15 years.

Electricity availability and costs played a role in Eaton Corporation's decision to locate two 100,000-square-foot data centers in Louisville, Kentucky. Eaton spokesperson Kelly Jasko says the Ohio-headquartered company found that the region's electricity rates are lower than other states the company considered. The \$160 million investment will consist of land, buildings, and information technology, and will be financed through industrial revenue bonds. Additionally, the facilities will utilize environmentally friendly and energy efficient practices in both construction and operations. The project is expected to create up to 20 new jobs at full operation in early 2013.

Then there's network presence. The site has to have outstanding links to the Internet. "If the client has a large proprietary network, they'll pick a location close to that," says Turner. "If they don't, then they'll want the availability of diverse fiber providers. Those are things that you can build, but they cost money."

Keeping the data center close to the users tapping into it is critical for certain applications. Latency refers to the time it takes for data to get from origin to destination, and for some customers a blink of an eye is just too long. "Latency issues can be very significant," says Southworth. "A microsecond may be a big problem." In such cases, a data center will need to be located relatively close to the user's primary location.

Healthcare is one such use. It's less likely that a hospital in Illinois, for example, is going to opt for a data center in the Pacific Northwest. Similarly, many collocation data centers — which serve multiple clients — are intentionally placed in the areas that they serve, which is why more than 80 percent of all states are home to these types of centers.

"Site selection for data centers is exceptionally important, but not for the same reasons that it is for other facilities," says Turner. Interestingly, many of the same location factors that make a site great for distribution or manufacturing cause it to be unappealing for a data center. "They want to be more than a mile from an interstate commerce path," he says. Why? Because bad things rumble down highways and rail right-of-ways — thousands of different kinds of chemicals and other hazards. An accident often means evacuation of the surrounding area, and "that area is often a mile radius."

The point is that drama is a major enemy of a data center — any kind of drama. Evacuations caused by highway or rail accidents, massive power outages, earthquakes, wildfires, mudslides, hurricanes. Even the vibrations of 18-wheelers or rail cars rolling past can be disruptive to the operations of data centers. "If you can locate a site where you are immune to these, it's a good site criteria."

That's one of the selling points, beyond cheap power, that makes the Buffalo Niagara region attractive to companies such as Yahoo!. "We don't get hurricanes, mudslides and the like," says Kucharski. "We don't have seismic activity, just a couple of good snowfalls in the winter."

Another thing data centers can live without, beyond natural disasters, is a wide range of people-based amenities. No need for big parking lots or lunchtime options, because data centers simply don't employ all that many people. "Data centers typically are extremely low-population sites," says Turner. "The people conveniences are really not that relevant to a data center."

As for the type of structure, today's bigger data centers are more likely to be located in new buildings than existing structures, Turner says, and they're typically just one story or two. "Clients that have a larger data center requirement typically will go to a new site for a number of reasons," he says. "The data center is really a form-follows-function type of facility. It's really driven around the computer room, and then you wrap a building around that. It's awkward to fit into an existing building."

### **Green Data Centers**

As the new Yahoo! project in New York illustrates, environmental concerns are of increasing importance. The company regularly buys carbon offsets to reduce its carbon footprint, but has recently said it would prefer to simply become carbon-neutral in its facilities. The new data center is a big step toward achieving that goal. For one thing, outside air will be used to cool the servers at all times — the company describes the design as being sort of like a chicken coop to allow for this green advance. And, of course, the hydro power is carbon-free.

Others in the industry are moving in a similar direction. Google has said it is seeking to increase energy efficiency in its data centers, and Microsoft is touting the efficiency of its data centers that recently opened in Chicago and Dublin, Ireland. The facilities employ what Microsoft calls "outside air economization" to help cool the servers.

"We're working with a client now that has an objective to be as green a data center as they can be," says Turner. Among other things, that means applying LEED standards wherever possible, such as making the most of daylight in office areas; Turner points out that there is a draft LEED standard for data center efficiency. Cooling is part of the picture, but so is making the servers themselves as efficient as possible. Companies would be asking for trouble if they pushed their servers too close to capacity, but in some cases it might be possible to reduce the instances where servers sit nearly idle. "With a group of servers, if you can take 5 percent utilization and make it 20 percent, you can reduce your energy consumption," he says.

Becoming more green is important for a number of reasons, says Southworth: "There's a growing concern about carbon taxes. A site may offer cheap coal power today, but just how cheap it will be tomorrow is up in the air, with environmental legislation and regulation a possibility." And, of course, there are the image reasons for building carbon-neutral facilities. "That's going to be viewed by shareholders and good corporate citizens as a plus," he says.

### **Communities Eager for Data Centers**

Kucharski couldn't be happier about landing the Yahoo! data center in his New York territory. But what's the big deal about these facilities? It's not like they offer hundreds of manufacturing jobs.

"It's not a job-intensive industry," says Southworth, "but there are jobs. Are these half-million-dollar positions? No, but they will be mostly in excess of the average income in a given area. It does create some jobs, and they're going to be by and large better paying."

Then there are the construction jobs. "These are very intensive, expensive construction projects. There's a lot of basic construction that will employ local people," he says. "[Data centers] may not produce as many jobs, but they generate a fair amount of taxes. When you have a fully built-out data center, you could easily put in computer equipment and servers worth \$100 million. That's going to be personal property and subject to local taxes."

A 100,000-square-foot data center will cost significantly more than a 100,00-square-foot warehouse, according to Turner, and that's great for the tax base. "That increase in the property tax base comes with very few demands," he says. "Parks, schools, traffic will all have very minimal impact."

The city of Longview, Texas, is actively working to attract data centers with the approval of a \$10.5 million bond issue for improvements to a local business park. The money will be used to improve infrastructure, including electricity, to the area. Local officials say the park is 30 percent complete and should be ready in early 2010.

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